M.O. 347.

The Meteorological Magazine

Air Ministry :: Meteorological Office

Vol. 67
Sept. 1932
No. 800

LONDON: PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

To be purchased directly from H.M. STATIONERY OFFICE at the following addresses: ADASTRAL HOUSE, KINGSWAY, LONDON, W.C.2; 120, GEORGE STREET, EDINBURGH; YORK STREET, MANCHESTER; 1, ST. ANDREW'S CRESCENT, CARDIFF; 15, DONEGALL SQUARE WEST, BELFAST; or through any Bookseller.

The Hot Weather in England during August, 1932

By LILIAN F. LEWIS, B.Sc.

On Thursday, August 11th, temperature rose to between 80°F. and 90°F. in many parts of England. Subsequently an anticyclone off northern Scotland moved south bringing cool north-easterly breezes on its southern side and temperature dropped almost to normal. Within a week, however, a hot spell of still greater intensity was being experienced in southern England and the Midlands. The southerly movement of the anticyclone continued and on the 16th high pressure extended from the Atlantic across England to Holland. Thereafter a cold front moving slowly south to northern England, the northward movement of a depression over Spain and a small rise in pressure over Germany all contributed to a weakening of the anticyclonic belt over southern England. For a time pressure became very uniform. Widespread fog occurred at times on the 17th and early hours of the 18th. The already warm, almost calm air and abundant sunshine raised the temperature to between 80°F. and 90°F at many places in southern England on the 18th. In France the heat was appreciably greater. Meanwhile a further northerly movement of the depression over Spain and the Bay of Biscay set up a gradient for southerly winds and the warmer air flowed up from France. On the 19th, maximum temperatures above 90°F. were recorded in many places. In London 99°F. was recorded in the Glaisher screen at

(99687) 107/27 1,050 9/32 M. & S. *Gp.303*

Greenwich and 97°F. at Regents Park and Camden Square. At Kew Observatory the maximum in the screen was only 92°F., but this is the highest temperature reached there since the historic hot spell round August 9th, 1911, when 94°F. was recorded. The maximum of 96°F. at Jersey is a record high temperature there.

Aeroplane ascents at Duxford showed a gradual increase of temperature at 850 mb. (approximately 5,000 feet)—59°F. on the morning of the 17th, 64°F. on the 18th and 72°F. on the 19th. The air between 3,000 feet and 7,000 feet also became increasingly dry, probably due to subsidence. At greater heights there was a corresponding fall in temperature. At 550 mb., or approximately 17,000 feet, there was a drop during the three successive days from 29°F. to 24°F. to 17·5°F., thus giving a very steep lapse rate by the 19th, but the air was still too dry for thunderstorms to develop. The upper winds showed south-easterly or southerly winds up to about 4,000 feet veering to south-westerly above on the afternoon of the 18th and south-westerly from 1,000 feet or 2,000 feet upwards on the morning of the 19th. The temperature, 72°F., at 5,000 feet on the morning of the 19th and 72·5°F. on the afternoon of the same day are the highest ever recorded at that height in this country, exceeding the previous highest, 71°F. on August 27th, 1930. (See *Meteor. Mag.*, 1930, page 176.)

The break occurred under rather complex conditions, cooler air coming in from the north-east over most of the country and from the west in the extreme south. Thunderstorms were delayed in southern England and the Midlands for some time after the cooler air had arrived and only developed during the late evening or night of the 20th. In southern Ireland the storm began in the morning of the 20th and in a belt across northern Ireland, northern England and southern Scotland in the afternoon or evening. In London the storm was observed to travel from south to north and there was a brilliant display of lightning. The fall in temperature was very sudden in the Midlands where the maximum on the 20th was more than 20° lower than on the 19th. At Birmingham the drop was from 91°F. on Friday to 66°F on the following day, a difference of 25°. By Sunday, the 21st, a new anticyclone, which developed off the north of Scotland began to spread southward and with it the front between the North Sea air of polar origin and the warmer air round the low-pressure areas to the south. On Monday this front had reached southern England and the maximum at Greenwich was only 68°F. as compared with 99°F. on the previous Friday. Some notable high minima were 70°F. at Croydon on the 19th and 73°F. at Lympne on the 20th. The reading at Croydon is the highest since observations were started there in 1920 and the one at Lympne is probably the highest

minimum recorded in the British Isles, being one degree higher than that registered at Ventnor on July 13th, 1923.

The areas chiefly affected by the heat were the southern, eastern and Midland districts of England. In Scotland and northern Ireland maximum temperatures on the 18th and 19th ranged mainly between 60°F. and 70°F. but on the 17th 74°F. was recorded at Aberdeen, 73°F. at Berwick-on-Tweed and 73°F. at Donaghadee.

It is interesting to compare conditions during this warm spell with the warmest experienced in London, namely that of August, 1911. In the latter case the Continental anticyclone was further north over Denmark and had moved in from the south-west, while pressure was persistently low over Iceland and a shallow trough moved eastward from the west of Ireland and the Bay of Biscay, bringing in light southerly breezes and warm continental air. In that case the trough apparently passed over London and south-east England without giving thunderstorms, although one occurred at Nottingham, thunder and lightning occurred at Birmingham and lightning was seen at Greenwich.

The following temperatures, observed at intervals of half-an-hour, were recorded at Kew Observatory on August 19th. The corresponding computed relative humidities are also given. The Assmann psychrometer was suspended at the eastern end of the Stevenson screen, 4 ft. above the ground. The values given are means of several readings extending over a period of 3 minutes centred at the times indicated.

Time G.M.T.	h.m. 11 15	h.m. 11 45	h.m. 12 15	h.m. 12 45	h.m. 13 15	h.m. 13 45	h.m. 14 15	h.m. 14 45	h.m. 15 15	h.m. 15 45
	Air temperature									
	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
Assmann	92·5	93·1	93·5	93·9	93·1	93·5	93·3	92·1	91·4	90·9
Stev. screen	91·9	92·9	93·3	93·7	93·2	93·3	93·1	93·2	91·5	90·9
North wall screen	88·7	89·6	89·6	90·7	90·7	91·3	91·1	91·1	90·3	90·5
	Relative humidity									
	%	%	%	%	%	%	%	%	%	%
Assmann	45	44	39	41	44	40	41	45	41	39
Stev. screen	42	42	37	37	36	38	37	36	37	36
North wall screen	50	50	48	46	46	45	45	42	44	43

It should be noted that the north wall screen is at the abnormal height of 10 feet above ground, while the Stevenson screen is on the lawn to the south-west of the building and exposed in accordance with standard Meteorological Office practice.

At South Kensington the temperature at 14h. 4m., G.M.T., on August 19th on the roof of the Meteorological Office about 60 feet above street level, as recorded by an Assmann electrically ventilated thermometer was 97.9°F. On the previous hot

day, August 11th, the following interesting records of temperature were obtained at South Kensington with an Assmann thermometer about 15h., G.M.T.

	°F.
On the roof	87
At street level, Imperial Institute Road—	
Sunny side	88
Shady side	86

These figures indicate that air temperature on the roof is about 1°F. below air temperature in the street on the sunny side and 1°F. above that on the shady side and that a decrease in temperature of 2°F. occurs on crossing from the sunny to the shady side of the street.

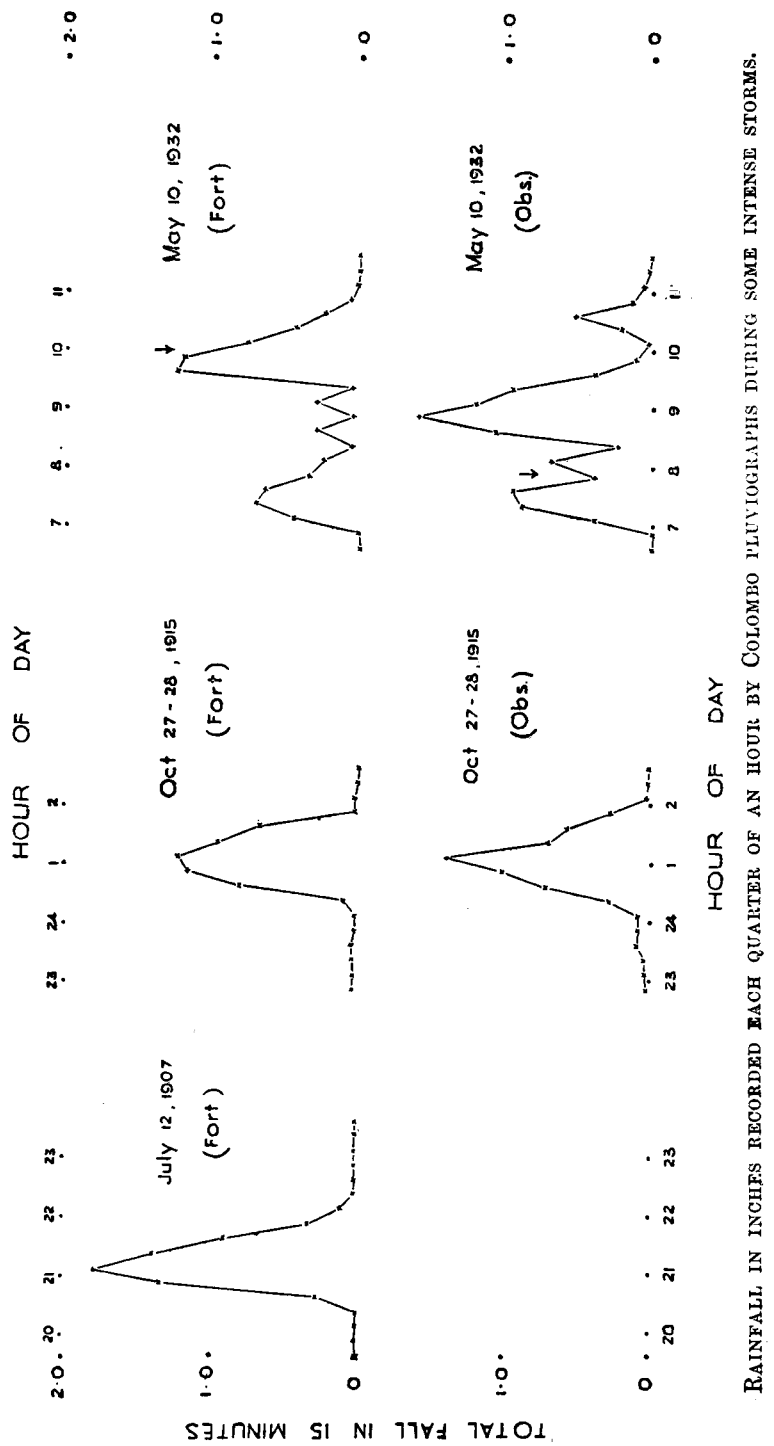
Heavy Rain at Colombo on May 10th, 1932

By H. JAMESON, B.Sc.

A rainstorm at Colombo on the morning of May 10th, 1932, which was one of the heaviest ever recorded by either the Obsersatory or the Fort pluviograph, presents some interesting features. Almost 10 inches of rain fell at the Observatory between 7 and 11 a.m., of which 9 inches fell in about 3 hours.

Unfortunately both the Fort and the Observatory traces are defective, as in each case the chart had to be changed during the storm, and the records at the commencement of the new charts are affected by backlash. Moreover, in the case of the Fort trace, the observer, who has to cycle down from the Observatory to attend to the observations, was considerably delayed by the torrential rain, with the result that the pluviograph pen had run off the paper on to the metal clip, except in the centre of the curved stroke, by the time the chart was changed. A third pluviograph, which had been sent in to the Observatory from an outstation for overhaul, happened to be left partly exposed to the rain, and its record, though imperfect, was sufficient, with the help of some experimental observations on the Observatory drum, to afford an approximate correction for the backlash on that trace.

The rain falling during each quarter of an hour has been measured up on each trace. Although the traces are imperfect, and the apportioning of the rain to the correct time intervals is difficult when the strokes are so crowded together, the figures give a sufficiently accurate idea of the main variations in the rainfall during the storm. These figures are plotted in the diagram, with corresponding figures for two other storms, which a rapid inspection of the pluviograms in file (Fort, 1898 to date; Observatory, 1909 to date) showed to be most closely comparable with it. No correction has been made in these curves for clock



RAINFALL IN INCHES RECORDED EACH QUARTER OF AN HOUR BY COLOMBO PLUVIOGRAPHS DURING SOME INTENSE STORMS.

rate or difference from standard gauge, of which there is one near each pluviograph. Such correction would not be more than five per cent., at the outside. An arrow shows the time, during the storm of May 10th, 1932, when the charts were changed.

The Fort pluviograph is on the roof of the Surveyor-General's Office, 70 feet above the ground, and, on account of its position, it underestimates very much the corresponding rainfall on a ground site. From comparisons with other gauges in Colombo, the correction to yearly totals must be of the order of twenty-five per cent., and though it is impossible to give definite corrections for individual storms, it is safe to say that such corrections will be appreciably positive.

The rainfall during this storm was very local, the heaviest falls being concentrated in the southern and central districts of Colombo. The rain recorded by the Fort pluviograph, which is $2\frac{1}{2}$ miles north-west of the Observatory, between 7 and 11 a.m., was 7.10 inches, which may correspond to a ground reading of about 9 inches, and the only rain-gauge stations which recorded comparable falls during the two rainfall days, May 9th-11th, were Maligakanda, about $1\frac{1}{4}$ miles north, and the Training College, about 1 mile west, of the Observatory.

The general weather conditions over Ceylon about this time wore not unusual for May. The flattish barometric gradients that are typical of the intermonsoon season about this time of year were in evidence during the first few days of the month. On the 9th and 10th, however, there was a more definite, though still weak, south-westerly gradient over the island. This had died down by the 11th, and intermonsoon conditions continued till the 16th, when the weak south-westerly gradient reappeared, and normal monsoon conditions set in definitely over Ceylon about the 18th.

When south-westerly monsoon currents first appear near Ceylon, the check at the coast must be considerably more effective than later on in the monsoon, as there is not only the difference between the friction of the sea and land surfaces, but also the inertia of air currents, that form local circulations over the island during the intermonsoon period, to be overcome. This affords a reasonable explanation of a tendency for rain to fall near the coast at the outset of the monsoon, rather than at the more solid obstruction formed by the hills further east.

The storm of May 10th must have been caused by this coastal check to the on-coming monsoon winds, though its unusual intensity was probably fortuitous. The anemometer charts at the Observatory, and at the Pilot Station in the Harbour, $3\frac{1}{2}$ miles to the north-west, are of distinct interest. The wind during the previous 24 hours was fairly light (averaging about ten miles per hour at the Pilot Station, where the exposure is unusually open), and generally south-easterly. Occasional

changes to a westerly direction were usually associated with rain. On the other hand, the general direction of the wind reported from ships at sea near the island was westerly, and most of the Ceylon coastal stations reported westerly to southerly winds. At Colombo the day (9th) was dull and overcast, with low day temperatures and high relative humidity, but the absolute humidity was appreciably lower than it had been for several days before. The observations suggest opposition between a local south-easterly wind and the westerly monsoon currents forcing it backwards or upwards.

After 7 a.m., on the 10th, when the heavy rain started, wind directions became very variable, and there were some marked differences between the directions recorded at the same time by the two anemometers. Although the rain-storm started and ended at practically the same time at both the Observatory and the Fort, the really heavy precipitation was nearly an hour later at the latter station. The opposing air currents were presumably entangled in a swirl, which would be complicated by the mechanical and thermal effects of the heavy rain.

Correspondence

To the Editor, *The Meteorological Magazine.*

Extremes of Heat in August

Commenting recently on the late date, August 19th, 1932, two months from the longest day, for a temperature of 99° at Greenwich, the meteorological correspondent of an important newspaper assumed that, had precisely similar meteorological conditions occurred in July, the temperature would have exceeded 100°F. But this seems to me to some extent to beg the question, inasmuch as experience does suggest that August, though averaging a little cooler than July, is actually the month for spurts of extreme heat corresponding to the liability of February to acute frost. That heat in August is commencing to leak out is very evident in the cooler types of August weather; but it should be remembered that with respect to July, the warmth has penetrated deeper into the soil, diffused higher into the atmosphere, and accumulated to a maximum in the sea. All these factors are conducive to very high temperature in August under certain conditions, and the best combination for extreme heat is probably more likely to occur in August than in July when the average warmth, though reaching a maximum in the surface of the soil and lower layers of the atmosphere, is less widely diffused.

Similarly it is only when one remembers these factors of accumulated warmth that the severity of September heat waves with the sun down to half-strength, becomes intelligible.

The peculiarly enervating character of August heat is probably

connected with the fact that the vapour pressure tends to be highest in a month when the seas round Britain are warmest. An intense August heat wave is also associated with an impressive hush over the countryside, for it is the month of the year when the birds are most silent.

L. C. W. BONACINA.

35, *Parliament Hill, London, N.W.3. August 22nd.*, 1932.

Unusual Thunderstorm Phenomena

Having read some accounts of lightning phenomena in past numbers of the *Meteorological Magazine*, I think the following may be of some interest to your readers.

Last night (August 20th) there were thunderstorms all around here from 9 p.m. till 12.30 a.m. (B.S.T.). At about 10.50 p.m. there was a very severe and complex lightning discharge almost immediately overhead. It was followed almost immediately by a sharp click, and then, after an appreciable pause, by a loud and prolonged clap of thunder. The click reminded me of a shot fired by a rifle on a miniature range. Rain was falling steadily but not very heavily at the time, and I do not think anything was struck.

Other discharges as near and even more severe were not followed by a click.*

DONALD WATERER.

Stanfield, Ferndown, Dorset. August 21st, 1932.

Heavy Rainfall and Flooding in Unst, Shetland

On Sunday morning, July 31st, there occurred a very heavy rainfall with flooding and damage. Saturday was rather dull with light winds but no appearance of rain. At about 22h. 30m., G.M.T., there was a slight drizzle, increasing later to a moderate rainfall. At about 5h. on Sunday there was a sudden downpour which continued until about 7h. We have no rivers or large streams in the Island of Unst, but the streams became in a very short time raging torrents, in many cases they rose seven to eight feet above their normal level. Footbridges and fences were carried away, fields of oats destroyed, roads destroyed, and large quantities of earth shifted forming new gullies on the hillside. By noon, most of the flooded areas were clear of water. I do not remember ever having seen in Shetland such a downpour in such a short time and the "oldest inhabitant" says he never remembers the like. Is the "oldest inhabitant" always to be relied upon? The amount measured on the morning of July 31st was 2·34 in.

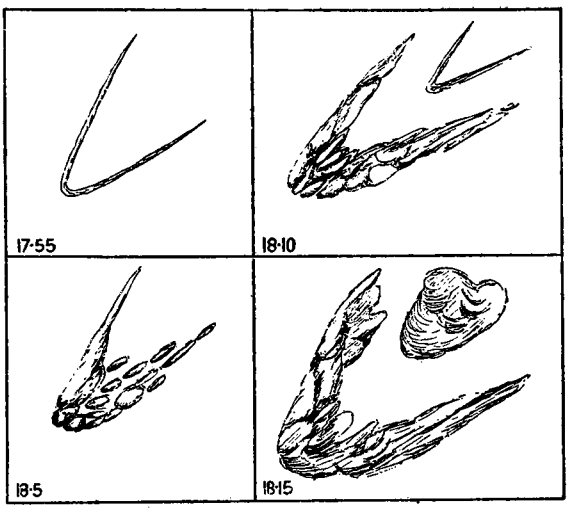
T. EDMONSTON SAXBY.

Baltasound, Unst, Shetland. August 3rd, 1932.

* A discussion of this phenomenon will be found in the *Meteorological Magazine* 63, 1928, p. 113 and p. 162.

Unusual Cloud Formation

I saw a most interesting and I believe unusual type of cloud formation last evening, August 30th, from 17h. 55m. to 18h. 15m. (G.M.T.)



Directly to the south of this station, there appeared in the sky at 17h. 55m. what appeared to me to be the exhaust fumes from an aeroplane, but as I had not seen or heard an aeroplane within at least seven hours, I knew that it must be a rather singular type of cloud formation. When I first observed it, it was a very fine streak in the sky. It was moving very slowly towards the east, and at 18h. 5m. it widened gradually from the base upwards to the top of the cloud forming into cirro-cumulus cloud. At 18h. 10m. approximately, another streak formed directly in line with the one just referred to, to the west of it. At 18h. 15m. this second streak appeared to roll and it finally formed into a round mass of cumulus.

T. F. Prosser.

Royal Agricultural College, Cirencester. August 31st, 1932.

Parhelion or Paraselena

While at Grayshott on August 16th I witnessed the following phenomenon. At 20h. 8m. the sky was half clouded with fairly dense cirrus, and looking up to a point about 43° from the horizon and 190° from the north there was a colourless patch of light exactly the size of the sun or moon when observed at that altitude. I took it first for a local thickening of the cloud, but the rate of cirrus movement was roughly 5° in 10 minutes and the patch of light appeared stationary while the clouds moved. The illumination was uniform over the area in question but around it the cloud was fibrous in texture. It was definitely not due to a star, as no bright star occupied that position at the time of observation and I could not explain it on the ground of artificial production. The only theory left is that it was in the nature of a parhelion or paraselena, but if this is the case it must have been an extraordinary one. The sun set at 19h. 19m., G.M.T., and the moon (full then) rose at 19h. 40m., so that the phenomenon cannot have been a mock-sun or moon

associated with any known halo. The light persisted until 20h. 21m., when it was scarcely visible. Measurements were made with a circular protractor.

S. E. ASHMORE.

22, Soho Road, Handsworth, Birmingham. August 31st, 1932.

Tornado in Sussex

At 5.29 p.m. (B.S.T.) to-day, I saw what appeared to be a cone of cloud descend from the edge of a large storm cloud. This cone was due north from this station and I should say, about 8 miles away. It appeared to grow rapidly larger and quickly descended to earth, being bent back towards the west and twisting round and round. All the time it was moving along very rapidly towards the north-east. Finally, after 3 minutes, it broke up from below and rapidly disappeared. It had all gone by 5.33 p.m., but in that time it had moved through about 10°.

There was a very large storm cloud present at the time stretching from south-west to north-north-east. A storm was raging about 5 miles west from here between 3.30 p.m. and 7.30 p.m.

On investigation I found about 10 miles north-north-east from here, near Wych Cross in the Forest (Ashdown) a trail of two fallen trees and many broken branches. Bushes and grass in the neighbourhood had been flattened, and there was a small amount of hay on some of the gorse for about 200yds.

LESLIE S. WOODHEAD.

The Gables, Barcombe, Lewes, Sussex. July 26th, 1932

[At Wych Cross itself there was a sudden thunderstorm about 6 p.m. which lasted about 20 minutes. It was accompanied by heavy rain but very little wind.—ED. *M.M.*]

NOTES AND QUERIES

The Thunderstorm of August 12th, 1932

For the second time within three weeks, the Rickmansworth and Chorley Wood district of Hertfordshire was visited by a thunderstorm of unusual severity early on Friday, August 12th. The storm approached rapidly from south-south-west over an easterly surface wind, breaking, it is believed, after only a single preliminary thunderclap. Increasingly heavy rain began at 4h. 55m. G.M.T., and from 5h. until 5h. 30m. the fall maintained a persistence of intensity unparalleled in the writer's twenty-seven years' experience of meteorological observing in England and abroad.

After about 5h. 2m. the deluge was accompanied by nearly continuous hail. The stones were spheroidal, and appeared to average 0·5in. in diameter, but were in some instances amal-

gamated into masses approximately the size of a golf ball. To save the radiation thermometers from destruction, a journey that will not readily be forgotten was made to the instrument enclosure at 5h. 5m. The assault of ice and water can only be described as terrific. At 5h. 30m. the hail ceased abruptly, and there was a progressive slackening of the rain. By 5h. 40m., when the gauge was examined, the fall was over, except for 0·01in. The measurement for the 45 minutes from 4h. 55m. to 5h. 40m. was 2·24in.—an amount that may well have been short of the true figure by reason of the hailstones rebounding from the funnel of the gauge. Both before 5h. and after 5h. 30m. the rain was not of outstanding violence, and it is estimated that of the measured total of 2·25in. yielded by the storm, nearly, if not quite, 2in. must have fallen within the half-hour.

The lower part of the garden and the adjoining country road, in common with most of Rickmansworth town, were flooded to varying depths, and a great deal of damage was done locally in this way. Throughout the morning fire engines were at work pumping water out of the ground floors of houses in the main street.

During the period of torrential rain there was an extraordinary purplish-copper tinge in what little light remained in the sky. The cloud-base appeared to descend to the tops of the surrounding hills (80ft. to 120ft. above station level and 260ft. to 300ft. above M.S.L.). Thunder, though never excessively loud, was almost continuous from 5h. to 5h. 30m., and a count of lightning frequency made between 5h. 10m. and 5h. 15m. gave 35 to 40 flashes per minute. The impression was gained that discharges of the cloud-to-cloud type predominated.

A remarkable feature of the storm was its association with a rapid increase of air temperature. Notwithstanding the extremely heavy character of the hail and rain, the thermograph at about 5h. showed a sudden rise of 5°F. from 59°F. to 64°F., followed by a very slow decline to 63° towards 6h. These changes were confirmed by eye observations of a thermometer exposed at a window under shelter. The suggested explanation is that a pool of chilled, stagnant air, such as normally forms in this cup-shaped valley under a clear night sky (which had prevailed prior to the approach of the storm), was suddenly displaced by turbulence at the onset of the out-blowing squall accompanying the arrival of the great cumulo-nimbus cloud overhead. Downward transfer of heat by eddy motion presumably led to sudden abolition of the nocturnal inversion, and immediately raised the air temperature at the valley bottom to approximate equality with that obtaining on the neighbouring high ground. The screen minimum in the early hours had been 57° compared with 65° at Kew and Hampstead, the nearest stations from which reports are at present available.

There is evidence that the storm water percolated through the soil (sand and gravel over chalk) to a depth of 4ft. within four hours after the cessation of the rain. At 9h. the 4ft. earth thermometer read 62·2°F., 1·2°F. above the highest point hitherto registered since the instrument was installed in May, 1929. On the day preceding the storm the 9h. reading had been 60·7°F. The rise of 1·5°F. in 24 hours was more than twice as great as had been recorded within a similar interval on any previous occasion. Although the grass plot in which the thermometer is sunk had been extensively flooded, the close-fitting cap had kept the interior of the iron containing tube perfectly dry; it thus seems necessary to infer that the unprecedented increase in the 4ft. subsoil temperature was due to sudden conveyance of heat from the warm upper strata of the ground (the 6in. and 1ft. earth thermometers read 66·5°F. and 66·3°F. respectively) by infiltration of the flood water.

E. L. HAWKE.

The following remarks on the synoptic situation associated with the thunderstorm described by Mr. Hawke have been kindly supplied by Captain C. K. M. Douglas, B.A., of the Forecast Division of the Meteorological Office :—

" The storm was associated with a typical summer cold front, a very warm southerly current being displaced by a cooler south-west current. The sequence of developments was of a normal type. On August 11th there was a warm SE. wind behind a retreating anticyclone over Germany, and a spell of fine warm weather culminated in a hot day, the maximum temperature at Kew being 88°F. A SSW. wind was accompanied by a slight fall of temperature at high levels, temperature at Duxford having fallen 3° to 4°F. since the previous day above 10,000 feet, but having risen at lower levels. Associated with this increased lapse-rate, alto-cumulus castellatus clouds were visible late in the day in south-east England. The lower air was still too dry for thunderstorms, and the relative humidity at Duxford at noon was between 20 per cent. and 33 per cent. from 5,000 to 10,000 feet. The dryness at these levels may be attributed to subsidence in the anticyclone rather than to the continental nature of the air. By next morning the humidity in the upper air had risen decidedly, a new air mass having come over during the night, belonging to the straight southerly current outside the anticyclone. Pilot balloon ascents just ahead of the front showed a wind from just west of south from 1,000 feet upwards. The Duxford aeroplane ascent was made at 6h. 15m. G.M.T., just before the storm arrived, and the pilot was obliged to land at Martlesham. The observations are thus of special interest. They showed an inversion below 1,000 feet and an isothermal region to 1,700 feet, and then a slowly increasing lapse-rate. At 3,200 feet the temperature was 68°F., or 18°F. above the August

normal, whilst at 19,000 feet it was 10°F., only 7°F. above normal. The lapse-rate in the intervening layers was well above the saturated adiabatic rate, but was nowhere up to the dry adiabatic rate (at least when averaged between the levels where observations were taken, roughly every 1,600 feet). Probably the thrust of the under-cutting cold air was necessary to form clouds and so start the disturbance. Another ascent was made at 12.15 G.M.T. behind the cold front, and temperature had fallen from about 2,000 up to 12,000 feet, the fall being 6°F. from 3,000 to 6,500 feet and 4°F. at 10,000 feet.

The Rickmansworth storm was probably the same one as crossed South Farnborough, travelling in a south-south-west upper current of the order of 30m.p.h. Part of the same chain of thunderstorms moved rather slowly from west to east across London. The individual cumulo-nimbus clouds moved rather quickly from south-south-west and had a rather high base; a squall cloud moved from west a little lower down, but did not appear to be much below 4,000 feet. At Kingsway the cold front, as shown by wind and pressure, arrived at 5h. 30m. and temperature rose from 70°F. to 72°F. This point is covered by Mr. Hawke's remarks above. Though the London temperature was much higher than at Rickmansworth there was doubtless a small inversion. The heavy rain with the storm arrived at 6h. 40m., and the temperature fell to 70°F. The storm produced the characteristics of a second cold front, but this was probably due to the rain, and the interval of 70 minutes between the first front and the storm was probably due to a fair depth of cold air being required to start off the storm in the early morning.

It is probable that the portion of the storm belt which crossed London had only recently developed. Lightning and a little thunder were observed much earlier in the night to south and south-west of London. An observer a few miles south-west of Dorking first saw lightning far to south-south-west at 22h. A single near flash to earth accompanied a shower at 2h., but the storm then died out. A slight storm reported before 1h. at Calshot, before the front arrived, was probably one of these early storms. No further rain or loud thunder occurred in the Dorking area.

The storm was fairly widespread in eastern England, but the west seems to have largely escaped. It was widespread in Scotland and northern Ireland and (according to reports in the Press) was severe in many places. These northern storms were not due to the same cold front as those in England, but were associated with the same irregular shallow depression, and with part of the same south-south-west upper current, in which the lapse-rate of temperature was probably high over a large area.

The following extracts from observers' notes indicate the progress and intensity of the storm in the London area :—

(*Victoria.*) Much thunder beforehand; rain very heavy to start with, then only moderate rain and occasional thunder. No hail observed. The heavy rain lasted only a short time.

(*Clapham-Kingsway.*) No thunder nor rain noted at Clapham up to 6h. G.M.T. Large drops—splash size of half a crown—observed at Elephant and Castle at 6h. 15m. G.M.T. Rain slight—began in Kingsway at 6h. 25m. G.M.T.

(*Kingsway-Norwood.*) Increasing heavy rain at Kingsway about 6h. 45m. G.M.T. Very heavy about Kennington. By 7h. 30m. precipitation had stopped at Norwood. Hailstones found in garden at least 10 minutes after cessation of storm of $\frac{1}{2}$ inch estimated diameter. Some of the larger hailstones estimated at $\frac{3}{4}$ inch diameter and flattened. Some of the smaller hailstones were quite clear and were apparently simply frozen water-drops.

(*Wallington.*) Heavy rain, with some hail, for about 20 minutes round about 6h. 30m. G.M.T. Hail in no way remarkable. Rumbling thunder for an hour or so beforehand.

(*Motspur Park, New Malden.*) The approach of this storm was noted at 6h. 10m. G.M.T. apparently coming up the Thames Valley towards London. There was, however, another smaller storm centre to the south-east, but the two centres did not seem to connect in any way. The main storm skirted this district and heavy rain fell for only 5 minutes, 6h. 20m.—6h. 25m. No hail was noted, but the storm passed much closer to Wimbledon, which is about $1\frac{1}{2}$ miles north-east of this district, where heavy rain and hail did some damage.

(*Highbury.*) Hailstones observed to be quite $\frac{1}{2}$ in. in diameter.

Mr. M. O'Connor, an observer at South Farnborough meteorological station, describes the storm and associated phenomena as follows :—

Mock Suns following a Heavy Thunderstorm.

A heavy thunderstorm with unusually large hail occurred here about sunrise on the morning of August 12th, 1932. An optical phenomenon consisting of a counter-sun and mock sun was observed following the storm, which in view of the unusual position of the mock sun, may be of general interest.

It had been a thundery night. Lightning was first noticed about midnight, and a storm occurred at 1h. 40m. G.M.T. and lasted about an hour. A much heavier storm first heralded its approach from the south-west at 4h. 10m., and was at its height from 4h. 45m. to 5h. Heavy hail occurred from 4h. 46m. till 4h. 57m., the hailstones measuring $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter during the first part of this period. More than one local resident states that still larger hail fell in the last minute of this period

and in one case eight hailstones placed end to end covered 10 in. The hail was observed to consist of a solid opaque nucleus surrounded with a layer of clear ice 1/16 in. thick in the case of the smaller stones.

At 5h. 5m. the storm was moving away north-eastward; blue patches in addition to much false cirrus were visible in the zenith. Further broken cumulus at 4,000 ft. was observed to the south-west at 25° elevation and alto-cumulus associated with alto-stratus at about 8,000 ft. was visible at a greater distance in the same direction.

As the sun in the east was breaking through the cumulo-nimbus which was passing away north-eastward, an unusual red colouring of the broken cumulus to the west-south-west attracted attention. A small portion only of the cumulus was so coloured, and the manner of the colouring suggested that the refracted rays were coming from behind the cloud. As the broken cumulus advanced in a north-easterly direction, an unusually bright white counter-sun became visible in the place of the coloured cumulus and against a background of the more distant alto-cumulus. After a few minutes, a white mock sun appeared at the same elevation as the counter-sun in a position 30° south of the latter. No arcs of contact or other halo phenomena were visible. The counter-sun faded at 5h. 22m. and the mock sun some three minutes later.

The Swan Song of the Radcliffe Observatory

It has been the custom of the Trustees to issue every five years a neat volume containing the results of the meteorological observations made at the Radcliffe Observatory, Oxford, printed *in extenso*. These volumes have been very welcome additions to our shelves, not only on account of the observations themselves, but because they frequently contained appendices giving valuable summaries of the previous observations or accounts of special investigations.

The last volume of the series was recently issued. It contains the daily observations for the years 1926 to 1930, and an Appendix by Dr. Knox Shaw and Mr. J. G. Balk, which is one of the most useful and interesting things of its kind that has ever been published. The authors have gone over the whole of the Radcliffe observations with a critical eye, and by applying corrections necessitated by changes of instruments or exposure have produced a homogeneous set of serial monthly values for each element, going back to the earliest date for which comparable data are available. In some cases data are available for earlier years, but the authors have done wisely in excluding from the tables, years in which the necessary corrections could not be applied with confidence. They have given

us tables of pressure, wet bulb temperature, maximum temperature, minimum temperature, grass minimum temperature, wind velocity, sunshine and cloud percentage back to 1881 and of rainfall and dry bulb temperature (daily mean) back to 1815. For the two latter elements there are also tables of period means, first for the six years 1815-1820, and then for decades.

There is perhaps nothing more stimulating to anyone with a taste for climatology than to see a table which shows at one glance the whole history of a particular element over a long period, and one may safely prophesy that references to this volume will be numerous in future papers. The following are a few facts derived from the tables :—

Temperature.

The ten-year annual mean has varied over a range of about 1°F. ; highest (1821-30), 49.5°F. ; lowest (1881-90), 48.4°F.

In January the ten-year mean has varied between 36.6°F. in 1821-30 and 40.7°F. in 1921-30; the thirty-year mean has varied between 37.2°F. in 1821-50 and 39.7°F. in 1901-30. In July, however, the thirty-year mean has only varied between 61.0°F. in 1821-50 and 61.6°F. in 1851-80.

The greatest variability of monthly mean temperature occurs in December, January and February, in all of which the mean for the warmest month is more than 17 degrees above the mean for the coldest month. The least variability (under 10 degrees) occurs in August and September.

The warmest month of any name was July, 1921 (mean temperature 67·5°F.) and the coldest, February, 1895 (mean temperature 28·5°F.). The mean maximum in July, 1911, and July, 1921, was 79·1°F. ; the mean minimum in February, 1895, was 22°F.

Absolute maximum (August, 1911)	94·9°F.
,, minimum (January, 1881)	5·9°F.
,, grass minimum (February, 1917) ...	−2·4°F.

Sunshine and Cloud.

Highest monthly total of sunshine (July, 1911)	310·4 hours
Lowest ,, ,, ,, (December, 1890)	5·0 ,,
Sunniest year (1899)	1,809·6 ,,
Least sunny year (1888)	1,158·3 ,,

It is of interest to note that these were not the years of minimum and maximum cloud percentage. The cloudiest year was 1897 with 72 per cent. and the sunshine in that year was not only well above the normal but actually higher than in the least cloudy year (1918) with 59 per cent.

The cloudiest months are January and December (72 per cent.) and the least cloudy September, (60 per cent.) and May (62 per cent.). The mean cloudiness is 66 per cent. a figure which is exactly equal to 100 minus the mean percentage duration of bright sunshine.

Rainfall.

Wettest month of any name (July, 1852) ...	7·60 in.
Driest ,, ,, ,, (February, 1891) ...	·01 in.
Wettest year (1852)	40·73 in.
Driest ,, (1921)	14·94 in.
Wettest decade (1871-1880)	27·56 in.
Driest ,, (1891-1900)	23·09 in.

There is only one point which calls for criticism, and that is the absence of any statement regarding the terminal hour to which the tables of mean maximum and mean minimum temperature refer. There appear to have been at least two changes in the hours of reading and setting the thermometers and each of these changes must have had some effect on the mean values of daily maximum and minimum. It is known, for example, that in winter months at an inland station the mean minimum for 24 hours ending 9h. may be something like 1°F. lower than the mean minimum for 24 hours ending 21h. This particular change of setting hour occurred at the Radcliffe Observatory at the end of 1924 and unless the results have been manipulated in some way to take account of such changes the tables are not strictly homogeneous.

This is the last Radcliffe volume we shall see. The observations are being continued so long as the staff remain in the building but they will cease when the impending move of the Observatory from its present site materialises. Arrangements have been made to ensure, as far as possible, that climatological observations will continue to be made in Oxford and summaries will be published in the *Monthly Weather Report*. We must, however, reconcile ourselves to the fact that we have concluded an important chapter in the history of British climatology, in the annals of which the volumes of Radcliffe observations must for ever hold an honoured place.

E. G. BILHAM.

Books Received

Annali del R. Ufficio Centrale di Meteorologia e Geofisica Italiano. Ser. 3. Osservazioni, 1922. Ministry of Agriculture and Forestry. Rome, 1931.

The katabatic winds of Poona, by S. Atmanathan, M.A. India Meteor. Dept. Sci. Notes, vol. iv, No. 40. Calcutta, 1931.

Obituary

Herbert George Watkins.—We regret to learn of the death of Mr. H. G. Watkins, leader of the Greenland Air Survey Expedition, who disappeared from his kayak while seal hunting in Lake Fiord, north of Angmagsalik in east Greenland, on August 20th, and was almost certainly drowned. Although so

young—he was born in 1907—he had already led three expeditions to Arctic regions. He entered Trinity College, Cambridge in 1925, and in 1927, when only 21, he was chosen leader of the University expedition to Edge Island, Spitsbergen. In 1928 he himself organised and led a party to explore the almost unknown interior of Labrador. The success of these two efforts led to his selection as leader of the British Arctic Air Route Expedition to Greenland in 1930-1, one of the most ambitious explorations of recent years. Its purpose was to explore the Greenland ice cap with a view to the establishment of an air route from Great Britain across the Arctic to Canada, and one of the main objects was the collection of meteorological observations, at sea level, on the ice cap and by aeroplane in the upper air. The observations on the ice cap were continued throughout the winter, Courtauld remaining alone at the station from December 6th to May 5th. A preliminary survey of the important results achieved, covering a period of nearly a year, was compiled by Mr. S. T. A. Mirrlees and published in the *Geographical Journal* for July. Mr. Watkins' own account of the general results of the expedition appears in the *Geographical Journal* for May and June, and contains many graphic descriptions of the weather. In June, 1932, Mr. Watkins was awarded the Founder's Medal of the Royal Geographical Society for his Arctic explorations; he was the youngest recipient of any of the Society's gold medals.

In July of this year Mr. Watkins left England to continue his mapping of east Greenland, and established a base at Lake Fiord. The news of his death, which came as a great shock, for he was expert at handling a kayak, called forth many tributes to his qualities of enterprise and leadership, both at home and abroad.

James Edward Crombie.—Dr. J. E. Crombie, who died on August 6th, 1932, graduated M.A. at Aberdeen University in 1882. Though he chose a business career instead of an academic one, he never lost touch with the University and during his lifetime he became one of its greatest benefactors; he placed his services ungrudgingly at its disposal, and took the deepest personal interest in its welfare. He filled the posts of Rector's Assessor and Chancellor's Assessor, and was a member of the University Court and all its departmental committees. For his valuable services to the University the Senate conferred upon him the degree of LL.D. in 1907. The various hospitals and convalescent homes in Aberdeen and its neighbourhood have likewise reason to be grateful to Dr. Crombie for his generosity and personal assistance in their development.

Dr. Crombie's hobbies showed a distinctly scientific bias. He was keenly interested in ethnology and was a Fellow of the

Royal Geographical Society. At his lovely home in Parkhill he maintained, for his private information, a small meteorological station with thermometer screen, rain-gauge, and sunshine recorder; and in 1914 he had a Dines pressure-tube anemograph installed in the woodland part of his estate in order to test the effect of trees upon the wind velocity. The head of the instrument is 75 feet above the ground but only 15 feet above the tree-tops, and the records obtained demonstrate a very gusty exposure.

Dr. Crombie was always greatly interested in meteorological matters, and for a number of years he was a member of the Edinburgh Meteorological Office Advisory Committee. Seismology, too, claimed a good deal of his spare time, and he maintained successively several different patterns of seismographs in constant operation, the last one being of the Shaw-Milne pattern.

Personally, Dr. Crombie was the most charming of men, kindly, courteous, and modest to a marked degree. He hated anything approaching publicity, and what he did do was done unostentatiously and for the love of the doing. To quote from the *Aberdeen Free Press*—"Few men have served public life more unselfishly than Dr. Crombie, or with less thought of the personal reward it might bring."

G. A. CLARKE.

The Weather of August, 1932

Pressure was above normal over the North Atlantic, Europe, northern Asia, northern Africa and California and Alaska. Areas over south-west Scandinavia and eastern Russia and Siberia had an excess greater than 5 mb. the greatest excess being 9·6 mb. at Ekaterinburg. Elsewhere in North America and in the Arctic pressure was below normal, the greatest deficit being 6·9 mb. at Spitsbergen. Temperature was generally above normal, it was normal in northern Sweden and was below normal in Portugal. Rainfall was generally deficient (as much as 70 per cent. in north-western Gothaland) but was in excess in northern Norway.

Over the British Isles the weather of August was mainly anticyclonic with breaks about the 11th, the 20th and at the end of the month. The outstanding characteristic was the heat over a large part of England (see p. 177), the nights, especially, being very warm. At Ross-on-Wye it was the warmest August since 1911 and at Lympne the warmest since the observations began in 1920. Rainfall was generally deficient but local thunderstorms caused considerable variations. The first few days were rather unsettled and cool, rain occurred in many places on the 1st and 2nd and there were local thunderstorms on the 4th. The

weather then improved under the influence of an anticyclone over southern England and temperature rose. There was much fog between the 4th and 10th and fog was dense in the Channel on the 5th. Fine and warm weather continued generally, except locally in Scotland and Ireland, until the 11th, when high maximum temperatures were recorded in many parts of England and Wales, including 91°F. at Camden Square, London. The anticyclone was by this time over Germany and cool westerly air from a depression in the mouth of the Channel cutting under the warm southerly current caused thunderstorms in eastern England, southern Scotland and northern Ireland on the night of the 11th to 12th (see p. 186). The weather became unsettled for a few days with shallow depressions crossing the British Isles. By the 15th there was a ridge of high pressure across the British Isles and anticyclonic conditions were re-established. Temperature gradually rose and the 18th and especially the 19th were very hot. The hot spell broke on the 20th-21st and in some places there was a considerable and sudden fall of temperature. Thunderstorms and heavy rain occurred in many places on these two days; several stations recorded more than an inch on the 20th, Henley-on-Thames recorded 2·22 in. and Wellington College, Berks, 2·57 in.; on the 21st Llanthony Lock, Glos., recorded 2·12 in. After a few days of cool, dry weather, temperature rose again about the 26th and during the last few days shallow depressions moving eastwards caused local rain or thunderstorms.

The distribution of bright sunshine for the month was as follows :—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway	132	— 1	Liverpool	153	—11
Aberdeen	141	— 9	Ross-on-Wye	174	0
Dublin	110	—52	Falmouth	179	—32
Birr Castle	101	—41	Gorleston	166	—40
Valentia	95	—60	Kew	196	+ 9

The special message from Brazil states that rain was scarce in the north and centre and plentiful in the south, the averages being 1·06 in. and 0·16 in. below normal and 1·89 in. above normal respectively. The crops were in good condition. The circulation was active, causing sudden variations in temperature, five anticyclones passed across the country. At Rio de Janeiro the pressure was 0·5mb. and the temperature 0·5° below normal.

Miscellaneous notes on weather abroad culled from various sources.

Severe hailstorms caused much damage in the Bavarian Alps at the beginning of the month and a cloudburst occurred

at Garmisch Partenkirchen on the evening of the 13th destroying parts of the railway. A heat wave was experienced along the Riviera between about the 15th and 17th when 108°F. was was reached at Cuers on the 16th and 107°F. at St. Raphael on the 17th. The intense heat extended over the whole of central and southern Europe from the 16th to 21st when 97°F. was reached at Berlin on the 20th and 21st, 95°F. at Paris on the 19th, 97°F. at Madrid on the 17th and 104°F. at Rome on the 17th. (*The Times*, August 3rd-22nd, *Bulletin Quotidien d'Etudes de l'Office National Météorologique de France* and *Daily Weather Report, Meteorological Office, London*).

Eight people were drowned and much damage was done in the neighbourhood of Erzerum (Anatolia) as a result of heavy rain at the beginning of the month. Heavy monsoon rains continued during the early part of the month in the Bombay Presidency but by the 25th the rains had ceased at Bombay though they were still being experienced in the United Provinces and Punjab. A break in the monsoon rains for about a week round about the 20th in Burma caused anxiety (*The Times*, August 4th-26th).

One of the heaviest snowfalls for some time was experienced on the Adelaide Hills, South Australia about the 15th and there were lighter falls in a number of country districts. Further rains in South Australia in the later part of the month have increased the prospects for a record agricultural season there while useful general rains fell in New South Wales and Victoria. Twelve thousand acres of rich dairy land have been flooded in the Wairarapa and Manawatu districts in the North Island of New Zealand. In parts the pastures have been covered with silt to a depth of 18 in. (*The Times*, August 16th-September 2nd.)

Extreme heat and lack of rain prevailed in the southern part of the prairie provinces of the United States early in the month, but elsewhere conditions were favourable for the crops. About the middle of the month conditions became favourable generally but towards the end heavy rains delayed harvesting. Twenty-five people were killed in a hurricane which swept along the Texas coast on the 13th. Temperature was generally above normal in the United States during the first half of the month and the rainfall about normal, although there were some heavy falls in the Mississippi Valley during the second week. (*The Times*, August 4th-31st, and *Washington, D.C., U.S. Dept. Agric., Weekly Weather and Crop Bulletin.*)

Rainfall, August, 1932—General Distribution

England and Wales	56	per cent of the average 1881-1915.
Scotland	54	
Ireland	62	
British Isles	57	

Rainfall: August, 1932: England and Wales.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Lond.	Camden Square	1·57	71	*Leics.*	Belvoir Castle.....	2·22	85
Sur.	Reigate, Alvington ...	·74	32	*Rut.*	Ridlington	1.52	61
Kent.	Tenterden, Ashenden...	·40	17	*Lincs.*	Boston, Skirbeck	1·72	72
,, .	Folkestone, Boro. San.	·44	...	,,	Cranwell Aerodrome ...	2·01	74
,, .	Margate, Cliftonville...	·68	35	,, .	Skegness, Marine Gdns	2·82	116
,, .	Sevenoaks, Speldhurst	·81	...	,, .	Louth, Westgate	1·99	71
Sus.	Patching Farm	·63	25	,, .	Brigg, Wrawby St. ...	1·47	...
,, .	Brighton, Old Steyne..	·55	25	*Notts.*	Worksop, Hodsock ...	1·38	56
,, .	Heathfield, Barklye ...	·60	22	*Derby.*	Derby, L. M. & S. Rly.	1·84	70
Hants.	Ventnor, Roy. Nat. Hos.	1·01	51	,, .	Buxton, Devon Hos. ...	1·45	33
,, .	Fordingbridge, Oaklnds	1·00	38	*Ches.*	Runcorn, Weston Pt...	1·08	30
,, .	Ovington Rectory	1·72	63	,, .	Nantwich, Dorfold Hall	1·84	...
,, .	Sherborne St. John ...	1·13	47	*Lancs.*	Manchester, Whit Pk.	1·57	45
Berks.	Wellington College ...	3·05	131	,, .	Stonyhurst College ...	1·65	46
,, .	Newbury, Greenham...	·92	35	,, .	Southport, Hesketh Pk	1·62	47
Herts.	Welwyn Garden City...	2·33	...	,, .	Lancaster, Strathspey	1·83	...
Bucks.	H. Wycombe, Flackwell	...	...	*Yorks.*	Wath-upon-Dearne ...	1·92	80
Oxf.	Oxford, Mag. College...	2·06	92	,, .	Bradford, Lister Pk. ...	·96	35
Nor.	Pitsford, Sedgebrook...	2·01	83	,, .	Oughtershaw Hall	1·72	...
,, .	Oundle.....	1·67	...	,, .	Wetherby, Ribston H.	1·86	68
Beds.	Woburn, Crawley Mill	4·31	186	,, .	Hull, Pearson Park ...	1·61	55
Cam.	Cambridge, Bot. Gdns.	2·35	100	,, .	Holme-on-Spalding ...	1·16	...
Essex.	Chelmsford, County Lab	1·09	50	,, .	West Witton, Ivy Ho.	1·19	41
,, .	Lexden Hill House ...	·80	...	,, .	Felixkirk, Mt. St. John	1·74	61
Suff.	Haughley House.....	2·81	...	,, .	Pickering, Hungate ...	2·04	79
,, .	Campsea Ashe.....	1·28	65	,, .	Scarborough	1·54	55
Norf.	Norwich, Eaton.....	...	...	,, .	Middlesbrough	2·41	88
,, .	Wells, Holkham Hall	2·44	102	,, .	Balderdale, Hury Res.	1·50	...
,, .	Swaffham, The Villa...	1·23	47	*Durh.*	Ushaw College	2·60	89
Wilts.	Devizes, Highclere.....	1.21	42	*Nor.*	Newcastle, Town Moor	2·17	74
,, .	Bishops Cannings	1·01	33	,, .	Bellingham, Highgreen	1·54	44
Dor.	Evershot, Melbury Ho.	·66	21	,, .	Lilburn Tower Gdns...	1·19	42
,, .	Creech Grange	1·09	38	*Cumb.*	Geltsdale.....	2·00	...
,, .	Shaftesbury, Abbey Ho.	·69	24	,, .	Carlisle, Scaleby Hall	2·17	53
Devon.	Plymouth, The Hoe...	1·86	60	,, .	Borrowdale. Seathwaite	...	...
,, .	Launceston, Werringt'n	2·33	...	,, .	Borrowdale, Moraine...	1·88	...
,, .	Holne, Church Pk. Cott.	2·08	47	,, .	Keswick, High Hill...	1·21	...
,, .	Cullompton.....	1·92	63	*West.*	Appleby, Castle Bank	1·00	30
,, .	Sidmouth, Sidmount...	1·61	57	*Glam.*	Cardiff, Ely P. Stn. ...	1·16	27
,, .	Filleigh, Castle Hill ...	2·10	...	,, .	Treherbert, Tynywaun	1·45	...
,, .	Barnstaple, N. Dev. Ath	1·21	37	*Carm.*	Carmarthen Friary ...	·60	13
,, .	Dartm'r, Cranmere Pool	2·10	...	*Pemb.*	Haverfordwest, School	2·30	55
Corn.	Redruth, Trewirgie ...	1·65	48	*Card.*	Aberystwyth	1·16	...
,, .	Penzance, Morrab Gdn.	1·69	53	,, .	Cardigan, County Sch.	1·33	...
,, .	St. Austell, Trevarna...	1·24	34	*Brec.*	Crickhowell, Talymaes	3·30	...
Soms.	Chewton Mendip	1·09	24	*Rad.*	Birm W. W. Tyrmynydd	1·33	25
,, .	Long Ashton	1·21	34	*Mont.*	Lake Vyrnwy.....	1·68	32
,, .	Street, Millfield.....	1·20	44	*Denb.*	Llangynhafal	1·72	58
Glos.	Blockley	5·58	...	*Mer.*	Dolgelly, Bryntirion...	1·74	34
,, .	Cirencester, Gwynfa ...	1·39	46	*Carn.*	Llandudno	1·85	61
Here.	Ross, Birchlea.....	1·97	77	,, .	Snowdon, L. Llydaw 9	3·90	...
,, .	Ledbury, Underdown..	2·70	103	*Ang.*	Holyhead, Salt Island	1·52	48
Salop.	Church Stretton.....	1·36	42	,, .	Lligwy.....	1·14	...
,, .	Shifnal, Hatton Grange	2·46	88	*Isle of Man*			
Worc.	Ombersley, Holt Lock	3·21	119		Douglas, Boro' Cem. ...	4·89	126
War.	Birmingham, Edgbaston	2·48	91	*Guernsey*			
Leics.	Thornton Reservoir ...	1·31	47		St. Peter P't. Grange Rd	·41	17

Erratum for July. Skegness, M

Rainfall: August, 1932: Scotland and Ireland.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Wigt .	Pt. William, Monreith	2·08	54	*Suth* .	Melvich	2·72	...
,, .	New Luce School	2·74	61	,, .	Loch More, Achfary	6·06	104
Kirk .	Carsphairn, Shiel	2·51	37	*Caith* .	Wick	2·72	99
Dumf .	Dumfries, Crichton, R.I	1·86	...	*Ork* .	Pomona, Deerness	2·97	103
,, .	Eskdalemuir Obs.	2·11	41	*Shet* .	Lerwick	3·71	123
Roxb .	Branxholm	1·68	52	*Cork* .	Caheragh Rectory	1·84	...
Selk .	Ettrick Manse	2·00	38	,, .	Dunmanway Rectory	2·65	56
Peeb .	West Linton	1·17	...	,, .	Ballinacurra	2·30	62
Berw .	Marchmont House	·75	23	,, .	Glanmire, Lota Lo	2·53	69
E.Lot .	North Berwick Res.	·21	7	*Kerry* .	Valentia Obsy	2·96	62
Midl .	Edinburgh, Roy. Obs.	·37	12	,, .	Gearahameen	2·90	...
Lan .	Auchtyfardle	1·09	...	,, .	Killarney Asylum	2·62	59
Ayr .	Kilmarnock, Kay Pk.	2·17	...	,, .	Darrynane Abbey	2·39	55
,, .	Girvan, Pinmore	1·84	41	*Wat* .	Waterford, Gortmore	2·13	56
Renf .	Glasgow, Queen's Pk.	1·26	36	*Tip* .	Nenagh, Cas. Lough	3·83	97
,, .	Greenock, Prospect H.	3·26	60	,, .	Roscrea, Timoney Park	3·24	...
Bute .	Rothesay, Ardencraig	1·46	30	,, .	Cashel, Ballinamona	2·33	66
,, .	Dougarie Lodge	2·45	...	*Lim* .	Foynes, Coolnanes	2·50	65
Arg .	Ardgour House	7·36	...	,, ,	Castleconnel Rec.	3·72	...
,, .	Glen Etive	...	...	*Clare* .	Inagh, Mount Callan	2·99	...
,, .	Oban	3·29	71	,, .	Broadford, Hurdlest'n.	2·91	...
,, .	Poltalloch	3·99	81	*Wexf* .	Gorey, Courtown Ho	2·51	75
,, .	Inveraray Castle	4·44	67	*Kilk* .	Kilkenny Castle	2·00	57
,, .	Islay, Eallabus	3·37	77	*Wick* .	Rathnew, Clonmannon	2·43	...
,, .	Mull, Benmore	...	...	*Carl* .	Hacketstown Rectory	2·48	61
,, .	Tiree	3·48	...	*Leix* .	Blandsfort House	3·27	83
Kinr .	Loch Leven Sluice	·42	11	,, .	Mountmellick	3·50	...
Perth .	Loch Dhu	2·55	38	*Offaly* .	Birr Castle	1·46	38
,, .	Balquhidder, Stronvar	3·22	...	*Kild'r.*	Monasterevin	...	...
,, .	Crieff, Strathearn Hyd.	1·64	39	*Dublin*	Dublin, FitzWm. Sq.	1·47	48
,, .	Blair Castle Gardens	1·82	54	,, .	Balbriggan, Ardgillan	2·69	79
Angus.	Kettins School	·85	26	*Meath.*	Beauparc, St. Cloud	2·16	...
,, .	Dundee, E. Necropolis	·87	26	,, .	Kells, Headfort	1·39	33
,, .	Pearsie House	1·31	...	*W.M.*	Moate, Coolatore	1·06	...
,, .	Montrose, Sunnyside	·69	25	,, .	Mullingar, Belvedere	1·99	48
Aber .	Braemar, Bank	·82	24	*Long* .	Castle Forbes Gdns.	2·97	73
,, .	Logie Coldstone Sch.	·99	31	*Gal* .	Ballynahinch Castle	4·55	83
,, .	Aberdeen, King's Coll.	2·10	77	,, .	Galway, Grammar Sch.	...	...
,,	Fyvie Castle	1·03	32	*Mayo* .	Mallaranny	3·48	...
Moray	Gordon Castle	1·52	48	,, .	Westport House	1·40	35
,, .	Grantown-on-Spey	...	...	,, .	Delphi Lodge	3·58	42
Nairn.	Nairn	2·01	42	*Sligo* .	Markree Obsy	2·55	59
Inv's	Ben Alder Lodge	2·46	...	*Cavan.*	Belturbet, Cloverhill	2·45	66
,, .	Kingussie, The Birches	1·67	...	*Ferm* .	Enniskillen, Portora	...	...
,, .	Loch Quoich, Loan	5·75	...	*Arm* .	Armagh Obsy	2·41	67
,, .	Glenquoich	6·86	84	*Down.*	Fofanny Reservoir	4·89	...
,, .	Inverness, Culduthel R.	1·09	...	,, .	Seaforde	4·57	122
,, .	Arisaig, Faire-na-Squir	3·95	...	,, .	Donaghadee, C. Stn.	2·53	76
,, .	Fort William, Glasdrum	4·32	...	,, .	Banbridge, Milltown	2·19	...
,, .	Skye, Dunvegan	4·71	...	*Antr* .	Belfast, Cavehill Rd.	2·63	...
,, .	Barra, Skallary	3·78	...	,, .	Glenarm Castle	2·13	...
R & C .	Alness, Ardross Castle	1·43	48	,, .	Ballymena, Harryville	2·17	51
,, .	Ullapool	3·54	100	*Lon* .	Londonderry, Creggan	2·46	53
,, .	Achnashellach	6·02	...	*Tyr* .	Omagh, Edenfel	2·19	51
,, .	Stornoway	4·57	...	*Don* .	Malin Head	1·64	...
Suth .	Lairg	2·32	73	,, .	Dunfanaghy	1·23	...
,, .	Tongue	3·24	101	,, .	Killybegs, Rockmount	1·50	27

Climatological Table for the British Empire, March, 1932

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean							
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal	Wet Bulb			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F	°F.	%	0—10	in.	in.			
London, Kew Obsy. ..	1015·0	+ 1·6	55	24	48·2	33·8	41·0	— 1·4	34·7	87	5·0	1·29	— 0·40	10	3·9	33
Gibraltar	1014·2	— 2·8	75	46	67·2	51·2	59·2	+ 1·7	50·9	82	5·8	4·76	— 0·03	13	..	..
Malta	1013·3	— 0·9	74	43	60·6	52·0	56·3	— 0·8	52·3	79	6·6	1·88	+ 0·40	13	6·0	51
St. Helena	1012·8	+ 0·4	72	59	68·1	61·2	64·7	— 1·6	61·9	94	8·7	6·69	..	24	..	..
Sierra Leone	1012·5	+ 1·8	91	72	87·8	75·3	81·5	— 0·9	76·1	78	4·7	1·29	+ 0·13	5	..	..
Lagos, Nigeria	1009·6	+ 0·7	91	71	87·4	77·0	82·2	— 1·2	77·5	80	8·1	2·61	— 1·14	11	5·5	46
Kaduna, Nigeria	1009·4	— 2·5	100	58	95·6	70·2	82·9	+ 1·8	69·9	54	5·7	1·98	+ 1·44	1	7·5	63
Zomba, Nyasaland ..	1009·1	— 0·6	84	61	79·4	65·0	72·2	+ 0·9	..	80	7·3	6·87	— 2·21	13	..	..
Salisbury, Rhodesia ..	1012·5	— 0·4	82	50	78·3	58·0	68·1	— 0·1	61·6	76	6·5	3·10	— 1·60	13	6·1	50
Cape Town.....	1015·4	+ 0·9	92	53	78·4	59·6	69·0	+ 0·9	60·4	78	3·6	0·74	— 0·14	8	..	..
Johannesburg	1012·8	— 0·1	81	45	74·1	54·1	64·1	+ 0·7	56·7	74	4·7	3·53	— 0·91	11	7·7	63
Mauritius	1010·9	— 1·1	88	70	84·7	73·4	79·1	+ 1·1	76·6	80	6·3	10·92	+ 1·55	24	7·4	61
Calcutta, Alipore Obsy.	1010·4	+ 0·5	100	63	94·5	71·4	82·9	+ 2·7	71·1	78	2·3	0·69	— 0·69	1*	..	..
Bombay	1010·8	— 0·1	96	70	88·5	73·5	81·0	+ 1·5	72·1	75	1·0	0·00	— 0·02	0*	..	..
Madras	1011·3	+ 0·4	94	66	88·6	70·7	79·7	— 1·4	73·7	76	3·1	0·00	— 0·34	0*	..	..
Colombo, Ceylon	1010·7	+ 0·6	92	69	88·2	73·7	80·9	— 0·9	76·1	74	5·3	2·60	— 1·68	11	7·8	64
Singapore	1009·8	+ 0·1	92	71	87·1	73·0	80·1	— 1·1	76·1	77	6·6	7·18	— 0·22	12	6·2	51
Hongkong	1017·3	+ 1·3	81	47	67·9	58·8	63·3	0·0	58·2	73	6·7	2·20	— 0·74	12	4·2	35
Sandakan	..	..	89	71	86·9	73·8	80·3	— 0·7	76·7	83	..	18·66	+ 10·19	15	..	..
Sydney, N.S.W.	1015·2	— 1·1	88	51	76·3	64·0	70·1	+ 0·8	64·8	70	6·4	3·11	— 1·87	10	7·0	57
Melbourne	1014·9	— 2·0	95	48	73·1	54·5	63·8	— 0·7	57·9	71	7·0	4·24	+ 2·06	16	5·1	41
Adelaide	1015·9	— 1·2	97	47	80·5	58·8	69·7	— 0·1	58·0	41	5·6	1·49	+ 0·46	9	7·4	61
Perth, W. Australia ..	1017·0	+ 1·7	97	50	79·6	60·7	70·1	— 1·1	59·1	53	3·9	0·17	— 0·64	2	8·8	72
Coolgardie	1014·9	+ 0·1	108	50	87·3	58·1	72·7	+ 0·8	58·1	47	3·1	0·55	— 0·39	2	..	..
Brisbane	1015·8	+ 1·4	89	63	84·2	67·8	76·0	+ 1·7	69·0	64	5·6	1·46	— 4·32	8	8·9	72
Hobart, Tasmania....	1013·6	— 0·6	83	44	67·4	52·0	59·7	+ 0·4	53·9	68	6·4	6·46	+ 4·76	13	5·8	47
Wellington, N.Z.	1022·9	+ 5·7	73	44	65·0	52·3	58·7	— 1·9	55·4	76	6·9	0·35	— 2·98	5	6·2	50
Suva, Fiji	1009·6	+ 1·2	90	71	86·2	74·6	80·4	+ 0·3	75·8	80	6·3	11·03	— 3·46	25	6·5	53
Apia, Samoa	1008·6	— 0·6	88	73	86·0	74·5	80·3	+ 1·0	77·1	77	5·2	14·20	+ 0·22	21	6·8	56
Kingston, Jamaica ..	1013·4	— 1·5	91	65	85·8	70·0	77·9	+ 0·8	67·8	79	3·8	0·22	— 0·80	1	9·1	76
Grenada, W.I.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Toronto	1011·1	— 6·2	58	5	34·8	23·5	29·1	— 0·5	24·4	68	6·2	0·15	— 2·26	3	3·9	33
Winnipeg	1019·7	+ 0·5	38	—20	17·8	0·8	9·3	— 5·7	..	..	3·7	0·00	— 1·16	0	6·1	51
St. John, N.B.	1002·4	—11·7	48	5	33·9	21·0	27·5	— 0·9	22·1	69	5·8	2·39	— 2·15	9	4·8	40
Victoria, B.C.	1016·8	+ 0·9	59	31	49·2	40·8	45·0	+ 1·5	41·9	87	8·4	3·86	+ 1·43	22	3·7	31

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.